

A THICK-KNEE (AVES: BURHINIDAE) FROM THE PLEISTOCENE OF NORTH AMERICA, AND ITS BEARING ON ICE AGE CLIMATES

By Alan Feduccia¹

ABSTRACT: A new species of thick-knee (Aves: Burhinidae) from the Pleistocene (Sangamon) of North America (Decatur County, Kansas) is described; it is named *Burhinus aquilonaris* new species. The genus *Burhinus* is a good indicator of dry, tropical savannah, and its presence in Kansas during the Sangamon is evidence that similar habitat existed in the High Plains at that time.

The late Professor Claude W. Hibbard of the University of Michigan amassed an exceptionally large collection of fossil birds in his quest for small mammals. These avian fossils are fundamental to our understanding of the late Pliocene avifauna of North America and have been reviewed and discussed elsewhere (Feduccia 1975).

Hibbard's theories on the climates of the Pliocene and Pleistocene of North America were less than well received over the years and even now are not generally accepted; this was a constant plague to him and resulted in many heated debates. "Hibbie," as he was affectionately known, was constantly awaiting additional fossil evidence to bolster his radical views of Plio-Pleistocene climates, but unfortunately there was little among the collections of fossil birds to provide clues to paleoclimate or paleoecology. One such fossil had been sent to the late Dr. Alexander Wetmore in 1943. I have examined the considerable volume of correspondence between Hibbard and Wetmore over this specimen. This began in 1943 and in it Hibbard continually urged Wetmore to publish a description of the fossil. Wetmore was extremely busy during those years, including among his duties being Secretary of the Smithsonian Institution. The fossil concerned was a thick-knee (*Burhinus*) from the Pleistocene of North America, and Hibbard had known its generic identity since the 1940's.

In a letter from Hibbard to Wetmore in 1962, Hibbard writes: "Back in the early 40's I collected a bird humerus. . . . I sent the material to Professor Loye Miller who considered it nearest to the Thick-knees of Tropical America. He returned it due to the lack of comparative material and suggested that I send it to you, which I did immediately. . . . Over the years I have told my classes of the occurrence of a Thick-knee in the fauna of Kansas from the very late Illinoian or early Sangamon. Have I been wrong? . . . Is the specimen good enough for identification? If so, and a Thick-knee, could you possibly

find time to report its occurrence. If it is such, I think it is quite important. . . ." Modern species of *Burhinus* occur only in dry, tropical savannahs, and Hibbard was most anxious to see the description appear. Over the years "Hibbie" constantly attempted to impress his students and colleagues with the importance of a Pleistocene thick-knee from North America. In an effort to complete some of Dr. Wetmore's unfinished work, the now famous thick-knee is here described. Wetmore left an incomplete description of this fossil and the name used here is that which he had chosen for it.

SYSTEMATICS

Order Charadriiformes

Family Burhinidae

Burhinus aquilonaris new species

Figure 1

HOLOTYPE: Left humerus (complete except for minor breakage in middle of outer margin of deltoid crest), University of Kansas Museum of Natural History, Vertebrate Paleontology No. 6822. Collected in August 1943, by C.W. Hibbard.

LOCALITY AND HORIZON: From the late Pleistocene (Sangamon) Sanborn Formation, bed No. 2, at level of highway culvert in bottom of draw on south side of Route U.S. 36, in NE ¼, Sec. 3, T.3, R.27W., Decatur County, Kansas. The holotype was mentioned specifically in an early report by Hibbard et al. (1944), who, in listing a jaw fragment of a prairie dog, *Cynomys ludovicianus* (Ord), "collected 6 feet [~1.8 m] below the soil zone in bed 2 at locality no. 10," remarked that "the remains of a bird (KUMVP No. 6822) . . . were found associated" with it.

MEASUREMENTS OF HOLOTYPE (in mm): Length 88.2; transverse width of shaft at center 5.2; transverse width across distal end 13.2.

ASSOCIATED PARATYPES (probably from same individual): A nearly complete left radius, the proximal and distal portions of a left ulna, three rib fragments, and a fragmented left ilium, same data and catalog number as holotype. These

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Figure 1. *Burhinus aquilonaris*, new species, holotype left humerus, University of Kansas Museum of Natural History, Vertebrate Paleontology No. 6822. From left to right, and bottom left to right: palmar, ventral, anconal, proximal, and distal views. All views $\times 1\frac{1}{2}$.

were found associated with the holotype humerus and almost certainly belong to the same individual. The fossil radius measures 94.3 mm in total length, those of the continental races of *B. bistriatus* (Wagler), 98.0 to 119.6 mm ($\bar{x}$ = 109.6, s.d. = 7.3, n = 13); of *B. b. dominicensis* (Cory), 91.9–92.9 mm; and of *B. superciliaris* (Tschudi), 87.7 and 94.2 mm.

ETYMOLOGY: Latin, *aquilonaris*, meaning northern or northerly.

DIAGNOSIS: Intermediate in size between the continental American races of *Burhinus bistriatus* and the smaller *Burhinus bistriatus dominicensis* of Hispaniola; slightly larger than *Burhinus superciliaris*. Fourteen specimens of humeri representing the continental races of *B. bistriatus* range from 91.0 to 103.6 ($\bar{x}$ = 96.8, s.d. = 4.6) in length; three specimens

of *B. b. dominicensis* range from 82.2 to 84.1 mm ($\bar{x}$ = 83.5, s.d. = 1.1); and two specimens of *B. superciliaris* measure 80.7 and 86.9 mm. Closest in characters to the living continental races of *B. bistriatus*, but differs in having (1) deltoid crest slightly longer; (2) bicapital furrow smoother, without definite depression at proximal end below head found in modern forms; (3) outline of head more angular, less smoothly rounded; (4) internal tuberosity slightly heavier; (5) ectepicondylar prominence with proximal external margin more angular; (6) entepicondyle more produced distally and more angular, with distal margin extending to level of distal margin of trochlea; and (7) brachial depression more sharply marked, with the impression of *M. brachialis anticus* more clearly defined.

REMARKS: The only record of an extinct species of *Burhinus* is that of *Burhinus nanus* Brodkorb (1959), described from Upper Pleistocene cave deposits on New Providence Island, Bahamas. This species, based on a left coracoid, is distinguished from modern *Burhinus bistriatus dominicensis* of Hispaniola by smaller size.

In addition, *Burhinus superciliaris*, a small South American burhinid that is common in semi-arid regions of northwestern South America (extending to northern Chile) is known as a fossil from the late Pleistocene of southwestern Ecuador, and from the late Pleistocene Talara Tar Seeps in northwestern Peru (Campbell 1976, 1979). A larger American burhinid, *Burhinus bistriatus*, that is known in arid regions from northern South America northward into southeastern Mexico, is not definitely recorded in the fossil record, but Howard (1971) has reported burhinid fossils from the Pleistocene of Eddy County, New Mexico, and from San Josecito Cave in northeastern Mexico as approximating the living *B. bistriatus* in size.

HIBBARD'S INTERPRETATION OF PLIOCENE AND PLEISTOCENE CLIMATES

Hibbard was greatly impressed with the presence of large land tortoises (*Geochelone*) in North America during the Pliocene and Pleistocene. In a now classic paper (Hibbard 1960), he outlined a general climatic interpretation based on the assumption that the overall physiology of large tortoises did not differ significantly from that of the living species now restricted to the Galapagos Islands, South America, Africa, Madagascar and other islands of the Indian Ocean, Ceylon, India, and southeastern Asia.

There is considerable dispute as to what constitutes the end of the Upper Pliocene and the beginning of the Pleistocene, a time that falls within a North American land mammal age, the Blancan. The reason for this is that the first Pleistocene fauna was also the last Pliocene fauna. In addition, there was no boreal fauna (as at present) to be shifted southward with the southward movement of the first continental glacier and provide a paleontological indication of the onset of glaciation. Nonetheless, Hibbard considered the very large, thick-shelled land tortoise, *Geochelone rexroadensis* (Oelrich 1952), found in association with a smaller tortoise, *G. turgida* (Oelrich 1957), in the Rexroad Formation, to indicate an equable climate in Kansas in the Blancan, a climate in which freezing conditions did not exist. As he stated (Hibbard 1960:17), "It is not known how far north the large tortoises ranged during the Upper Pliocene, but it can be assumed that part of the Upper Pliocene was as equable as the climate during part of the first interglacial which allowed these large tortoises to live as far north as Brown County, Nebraska (McGrew 1944:48-49)." It seemed clear to Hibbard that there was no evidence to indicate that, "Conditions essentially the same as those of the present were reached by the Upper Pliocene . . . but the outbreaks of polar air so characteristic of the present winters appear to be a development of the late Pliocene" (MacGinitie 1958:70-71).

Faunas of the first glacial, or Nebraskan, are not well known, and no fauna has been found that would have been characteristic of the maximum extent of continental glacial advance. However, immediately prior to the Nebraskan, the

giant land tortoises are known from the High Plains region as far north as northern Nebraska (Sand Draw Locality—see Zakrzewski 1975 for age), and parts of a large tortoise have been found in deposits of the first interglacial (Aftonian) in Meade County, Kansas (Deer Park local fauna). The pygal scute of a tortoise from Nebraska represents a specimen of approximately 2 m length (McGrew 1944). Hibbard (1960:19) concluded that, "These large tortoises lived in a subtropical climate . . ." In addition, the occurrence of a large, thick-shelled *Geochelone* from the Aftonian Borchers local fauna of Meade County, Kansas (above the Pearlette ash—see Zakrzewski 1975), indicated to Hibbard (1960:21), "a subtropical climate with winter temperatures not lower than 32°F [0°C]." Even during the second glacial, the Kansan, remains of a large, thick-shelled *Geochelone* (estimated length, 2 m) are known from the Seymour Formation of northern Texas below the Pearlette ash, in association with remains of alligator, glyptodonts, a giant armadillo, ground sloths, *Stegomastodon*, mammoths, tapirs, horses, and a leptodactylid frog. This association indicated to Hibbard that in Texas during the late Kansan the winters must have been considerably warmer than at present. By the Illinoian, or third glacial period, the High Plains faunas take on an aspect of a more northern Recent fauna than those of either the Nebraskan or Kansan. But even in the third interglacial, or Sangamon, the large tortoises (*Geochelone*) appear again in southwestern Kansas (Cragin Quarry local fauna). These indicated to Hibbard that during the Sangamon there existed in southwestern Kansas subtropical conditions with winter temperatures seldom or never lower than 0°C. The last glacial, or Wisconsin, period is characterized by the massive extinctions of the vertebrate fauna that characterized the end of the Pleistocene of North America. Even the giant tortoises that had been present continuously in Florida throughout the Pleistocene became extinct. These extinctions, which began approximately 12,000 years ago, are attributed by Martin (1958 and numerous subsequent papers) to man rather than climatic change, but Grayson (1977) has pointed out that birds and mammals underwent comparable amounts of generic extinction. The magnitude of avian extinctions (at the same time as the mammalian extinctions) is incompatible with Martin's "Pleistocene Overkill Hypothesis." This evidence would, of course, lend support to Hibbard's view that the harsh climate and associated climatic zoning of Recent times was a consequence of the Wisconsin glaciation. This view probably also explains the massive Pleistocene extinctions without the intervention of man.

BURHINUS IN THE PLEISTOCENE OF NORTH AMERICA

Hibbard was extremely anxious for avian paleontologists to describe the fossil birds that he had discovered, but as the descriptions emerged there was little in the way of avian indicators of climatic conditions in the Pleistocene. Collins (1964) had identified some of the ibis bones as belonging to taxa now confined to the Neotropics, but the bone fragments used in his identifications are unidentifiable (Feduccia 1975). *Burhinus aquilonaris* represents the first of Hibbard's avian fossils to clearly indicate something of the Pleistocene paleoclimate and paleoecology of the High Plains. The various species of thick-knees (Burhinidae) are widespread in tropical regions of the

Old World. In the New World, the genus *Burhinus* is at present confined to Hispaniola and arid portions of the mainland from southern Mexico to Peru and Brazil. The genus is characteristic of dry, scrubby, open country. Slud (1964:102) states that in Costa Rica *Burhinus bistriatus* is "an indicator species of the scrubby . . . cattle country, frequents openings in bushy and thickety growth amid low woodland as well as open ranges and coastal grassy 'plains' akin to salt marshes. A terrestrial bird, occurring singly or in small groups, it is both diurnal and nocturnal." Slud's description is typical for the American species of *Burhinus*, and can be reasonably extended to characterize the Pleistocene species as well. The species of *Burhinus* are thus good indicators of tropical, dry savannah, and we can assume this to have been the habitat in Decatur County, Kansas, during the Sangamon when *Burhinus aquilonaris* lived there.

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